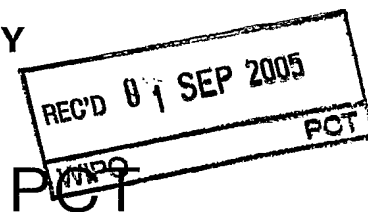


PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY



To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/GB2005/000002

International filing date (day/month/year)
05.01.2005

Priority date (day/month/year)
06.01.2004

International Patent Classification (IPC) or both national classification and IPC
H01M4/92, H01M4/88, H01M4/86, H01M8/10

Applicant
IC INNOVATIONS LIMITED

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☒ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/GB2005/000002

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ in written format
 - ☐ in computer readable form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/GB2005/000002

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application,
- ☒ claims Nos. 16-21

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 16-21 are so unclear that no meaningful opinion could be formed (*specify*):

see separate sheet

- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☐ no international search report has been established for the whole application or for said claims Nos.
- ☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form ☐ has not been furnished
☐ does not comply with the standard

the computer readable form ☐ has not been furnished
☐ does not comply with the standard

- ☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.
- ☒ See separate sheet for further details

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/GB2005/000002

Box No. IV Lack of unity of invention

1. ☐ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has:
- ☐ paid additional fees.
 - ☐ paid additional fees under protest.
 - ☐ not paid additional fees.
2. ☒ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- ☐ complied with
 - ☒ not complied with for the following reasons:
see separate sheet
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☐ all parts.
 - ☒ the parts relating to claims Nos. 1-15

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-4,9,11
	No: Claims	5-8,10,12-15
Inventive step (IS)	Yes: Claims	
	No: Claims	1-15
Industrial applicability (IA)	Yes: Claims	1-15
	No: Claims	

2. Citations and explanations

see separate sheet

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/GB2005/000002

Box No. VI Certain documents cited

1. Certain published documents (Rules 43*bis*.1 and 70.10)
and /or
2. Non-written disclosures (Rules 43*bis*.1 and 70.9)
see form 210

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item III.

Claims 16-21 do not meet the requirements of articles 6 PCT in that matter for which protection is sought is not clearly defined. The claims attempt to define the subject-matter merely by a vague reference to the description and/or to the drawings. In particular, according to Rule 6.2 (a) of the Regulations Under the PCT, claims shall not, except where absolutely necessary, rely, in respect of the technical features of the invention, on references to the description or drawings. Therefore, no opinion regarding novelty, inventive step and industrial applicability is given on these claims.

Re Item IV.

Lack of unity of invention

Specification according to rule 40.1 PCT of the reasons for which the international application PCT/GB2005/000002 is not considered as complying with the requirement of unity of invention according to Art. 3(4)(iii) PCT and Rule 13 PCT.

According to the PCT International Search and Examination Guidelines, Part III, 10.06 (as in force from March 25, 2004), unity of invention has to be considered in the first place only in relation to the independent claims.

There are 2 subjects:

- 1) A catalytic system comprising a catalyst comprising nanoporous or mesoporous palladium and an ion-exchange electrolyte.
- 2) A multi-component catalyst comprising a nanoporous or mesoporous palladium and one or more of platinum, iridium or rhodium, gold, ruthenium, osmium, silver, nickel, copper, cobalt, iron, chromium, lead, vanadium, tungsten, carbon, nitrogen, oxygen, sulphur, selenium, tellurium or phosphorous.

It appears that within these subjects unity does not exist for the following reasons:

- A) The "same" or "corresponding" technical feature between these subjects is a catalyst

comprising a nanoporous or mesoporous palladium. This feature is already known from US 6395230 (D2) (see the abstract, description c. 3, l. 62-67 and c. 6 l. 60-65, and claims 1-5).

Therefore, this feature is not a special (new and inventive) technical feature. Thus, no "same" or "corresponding" special technical features could be found between the subjects, as required by Rule 13.2 PCT.

B) Also the common problem underlying the invention, increasing activity of a catalyst, is well known in the art, see e.g. D2 (c. 2, l. 15-20) or D3 (p. 1444, c. 2, l. 1-4).

No other common problem could be found which could serve as the general inventive concept required by Rule 13.1 PCT.

Consequently, these claims are not unitary according to Rule 13 PCT.

C) Thus, the application is split into 2 groups of (alleged) inventions:

Group I) Claims 1-4, 11 and claims 7-10 (in part) and 12-15 (in part)

Group II) Claims 5, 6 and claims 7-10 (in part) and 12-15 (in part)

The Applicant should be aware that for above mentioned groups I and II a full search has been carried out, without additional searching effort and consequently no additional fees are asked for the search; this does not however imply that each of said (groups of) inventions, fulfil(s) the requirement of unity of invention stipulated in Rule 13.1 PCT.

Re Item V.

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:

D1 : US 6 203 925 B1

D2 : US 6 395 230 B1

D3 : ATTARD G S ET AL: "Mesoporous Pt/Ru Alloy from the Hexagonal Lyotropic Liquid

Crystalline Phase of a Nonionic Surfactant" CHEMISTRY OF MATERIALS,
AMERICAN CHEMICAL SOCIETY, WASHINGTON, US, vol. 13, 27 April 2001
(2001-04-27), pages 1444-1446

2 NOVELTY

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of **claims 5-8,10 and 12-15** is not new in the sense of Article 33(2) PCT.

2.1 Document D1 discloses (see the abstract and c. 5, l. 27- c.6, l. 35 and the examples of this document):

- A multi-component catalyst comprising a nanoporous or mesoporous palladium and one or more of platinum, gold, oxygen, sulphur;
- A process for the production of the catalyst as claimed in claim 5, said process comprising solidifying one or more metal precursors in the presence of a templating agent and then removing the templating agent;
- A process for the oxidation or reduction of inorganic and/or organic molecules comprising contacting said molecules with the catalytic system;
- A method for the detection of organic and/or inorganic molecules, in a sample comprising contacting said sample with a sensor and detecting the current due to the oxidation or reduction of the molecules.

- the organic molecule having from one to twelve carbon atoms (glucose);
- a fuel cell and a sensor comprising an electrode comprising the catalyst.

As such, the subject-matters of the **5-8,10 and 12-15** are disclosed by document D1 and therefore considered to lack novelty.

2.2 Document D2 discloses (see the abstract and the claims 1-10):

- A multi-component catalyst comprising a nanoporous or mesoporous palladium and one or more of platinum, iridium or rhodium;

- A process for the production of the catalyst as claimed in claim 5, said process comprising solidifying one or more metal precursors in the presence of a templating agent and then removing the templating agent;
 - A process for the oxidation or reduction of inorganic and/or organic molecules comprising contacting said molecules with the catalytic system;
 - A method for the detection of organic and/or inorganic molecules, in a sample comprising contacting said sample with a sensor and detecting the current due to the oxidation or reduction of the molecules.
-
- the organic molecule having from one to twelve carbon atoms (methane);
 - a fuel cell and a sensor comprising an electrode comprising the catalyst.

As such, the subject-matters of the **claims 5-8,10 and 12-15** lack novelty also over the disclosure of D2.

3 INVENTIVE STEP

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of **claims 1-4, 9 and 11** does not involve an inventive step in the sense of Article 33(3) PCT.

3.1 The document D3 is regarded as being the closest prior art to the subject-matter of claims 1-4, 9 and 11 and discloses (see p. 1444 and 1446):

- A catalytic system comprising a catalyst comprising a nanoporous or mesoporous noble metal (Pt/Ru alloy) and a cation-exchange electrolyte (Nation), the system showing an increased catalytic activity as compared to a system without the ion-exchange electrolyte;
- A process for the manufacture of the catalytic system comprising contacting the catalyst with the ion-exchange electrolyte;
- A process for the oxidation or reduction of inorganic and/or organic molecules comprising contacting said molecules with the catalytic system.

The subject-matter of **claims 1 and 11** therefore differs from this known catalytic

system in that the nanoporous or mesoporous noble metal comprises nanoporous or mesoporous palladium. The problem to be solved by the present invention may therefore be regarded as to provide an alternative catalytic system.

Faced with the problem, a skilled person would consider replacing platinum in the catalytic system by palladium, e.g. to broaden or modify its catalytic activity, as palladium is chemically close to platinum and is also commonly used as catalyst. Catalytic systems comprising mesoporous palladium, and having similar applications are known from document D1 (see the abstract and c. 5, l. 27- c.6, l. 35 and the examples of this document). It would be obvious to the person skilled in the art to combine the teaching of D3 and D1, thereby arriving at the solution according to **claims 1 and 11** without employing an inventive step.

3.2 Dependent claims 2-4, and 9 do not appear contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, the reasons being as follows:

3.2.1 The additional features of **claims 2 and 3** are anticipated by D3, and the additional feature of claim 4 is anticipated by D1 (Nafion is a cation exchange membrane).

3.2.2 The application of the catalytic system to e.g. methanol oxidation (**claim 9**) is obvious to a skilled person.

4 INDUSTRIAL APPLICABILITY

The subject matter of claims 1-15 meets the requirements of Article 33(4) PCT.

Re Item VI

Certain documents cited

Certain published documents

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/GB2005/000002

Patent No
WO 2004021481

Publication date
01/03/2004

Filing date
27/08/2003

Priority date (*valid claim*)
27/08/2002
26/08/2003

Re Item VIII

Certain observations on the international application

1 CLARITY

- 1.1 Although claims 7,10 and 15 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and/or in respect of the terminology used for the features of that subject-matter. The aforementioned claims therefore lack conciseness and as such do not meet the requirements of Article 6 PCT.
- 1.2 The terms "nanoporous" and "mesoporous" used in claims 1 and 5 have no well-recognised meaning and leave the reader in doubt as to the meaning of the technical features to which they refer, thereby rendering the definition of the subject-matter of said claims, namely the range of the pore size, unclear, Article 6 PCT.